

SAMPLING AND ANALYSIS PLAN
BODIE CREEK, MONO COUNTY
TOTAL MAXIMUM DAILY LOAD (TMDL)
FOR METALS

Impairment Verification Sampling

California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, California 96150

April 2004

Prepared by: _____

Anne Sutherland, Engineering Geologist

Reviewed by: _____

Laurie Scribe, Environmental Scientist

Approved by: _____

Bud Amorfini, Chief, Watershed Planning/TMDL Unit

Contact Person:
Anne Sutherland
Engineering Geologist
Watershed Planning/TMDL Unit
Asutherland@rb6s.swrcb.ca.gov
530/542-5450

Table of Contents

1. Introduction.....	1
Report Format	
Project Description	
Site Location	
Responsible Agency	
Project Organization	
Problem Statement	
2. Background	2
Location and Geography	
Hydrology	
Land Ownership and Uses	
Previous Investigations	
Regulatory Involvement	
3. Data Quality Objectives	4
Data Uses	
Contaminants of Concern	
Expected Concentrations	
Action Levels	
Field Parameters, Analytes, Analytical Methods, Action Levels and Reporting Limits	
Data Quality Indicators	
Data Review and Management	
4. Sampling Design.....	9
Sampling Locations and Rationale	
Sampling Schedule	
5. Sampling Methods and Procedures.....	9
Sampling Equipment	
Field Sampling Procedures	
Acidification of Metals Samples	
Alternate Procedures for Collecting Samples	
Field Information	
6. Quality Control Procedures	14
Duplicates	
Field Method Blanks	
7. Sample Handling, Documentation and Shipping.....	14
Bottles and Preservatives	
Holding Times	
Sample Identification	

Chain of Custody, Packaging and Shipment

8. References.....	15
---------------------------	-----------

Tables

Table 1. Analytes, Analytical Methods, Action Levels and Reporting Limits	6
Table 2. Preservation and Holding Times	15

Figures

Figure 1. Bodie Creek Location Map.....	17
Figure 2. Bodie Creek Conceptual Sampling Sites and Areas of Interest	18

1. INTRODUCTION

1.1. Report Format

This Sampling and Analysis Plan (SAP) is adapted from guidance prepared by the Quality Assurance Program, United States Environmental Protection Agency - Region IX (U.S. EPA, 1997). EPA developed this guidance to assist in the preparation of a combined Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) for one-time and short-term field sampling events.

1.2. Project Description

Staff of the Lahontan Regional Water Quality Control Board Regional Board (RWQCB) will collect surface water samples from Bodie Creek for dissolved and total metals and cyanide analysis. Four in-creek locations will be sampled once per month during April, May and June 2004. Samples will be shipped to Lahontan RWQCB's contracted laboratory, CLS Environmental Lab in Rancho Cordova, California, for analysis.

1.3. Site Location

Bodie Creek is located in eastern Mono County, California, in the Bodie Hills, a group of mountains east of the Sierra Nevada at the western edge of the Great Basin. Figure 1 shows the site location.

1.4. Responsible Agency

Lahontan Regional Water Quality Control Board Regional Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150
530/542-5400

1.5. Project Organization

Project Manager:

Anne Sutherland, Engineering Geologist, Lahontan RWQCB
Phone: 530/542-5450; Email: asutherland@rb6s.swrcb.ca.gov

Field Sampling Coordinator:

Laurie Scribe, Environmental Scientist, Lahontan RWQCB
Phone: 530/542-5465; Email: lscribe@rb6s.swrcb.ca.gov

Quality Assurance Officer:

Bud Amorfini, Senior Environmental Scientist, Lahontan RWQCB
Phone: 530/542-5463; Email: bamorfini@rb6s.swrcb.ca.gov

Laboratory Manager:

James Liang, Lead Analyst, CLS Labs, Rancho Cordova, CA
Phone: 800/638-7301; Email: jamesl@californialab.com

1.6. Problem Statement

The U.S. Bureau of Land Management (BLM) identified contamination in Bodie Creek in 1985 when one surface water and one sediment sample indicated elevated levels of mercury and arsenic (Dynamac, 2002). These data were cited in the BLM's 1990 Draft Resource Management Plan and Environmental Impact Report for the Bodie area (U.S. BLM, 1991). Based on this information, the Lahontan RWQCB placed Bodie Creek on the 1991 Clean Water Act Section 303(d) list of impaired waters. The 1985 BLM data were limited and are now almost 20 years old; therefore, this investigation is needed to investigate current concentrations of metals in the creek.

2. BACKGROUND

2.1. Location and Geography

Bodie Creek is located in the Bodie Hills at approximately 38.2156 °N latitude, 119.0100 °W longitude (NAD 27). The Bodie Hills, encompassing approximately 390 square miles, occupy portions of Mono County, California, and Lyon and Mineral counties, Nevada. This sampling effort is focused on the California portion of Bodie Creek.

The small rural communities of Bridgeport, Lee Vining and Mono City are the nearest populated areas. The topography of the area is mountainous, with elevations ranging between 8,375 feet above mean sea level (amsl) at the historic town of Bodie, to over 8,780 feet amsl atop Bodie Bluff. Access to the area can be gained from U.S. Highway 395 by traveling approximately 13 miles east on State Route 270 to the Bodie State Historic Park (SHP), which is administered by the State of California - Department of Parks and Recreation.

2.2. Hydrology

Bodie Creek flows northeastward from its headwaters near Bodie SHP, joins Rough Creek in Nevada approximately 8 miles downstream, then flows to the East Walker River. Streamflow in upper Bodie Creek is seasonal, with most flow occurring during the late fall through spring. Snowmelt runoff provides most of creek's seasonal flow. In most years, surface flow in the creek disappears typically one mile downstream of Bodie State Historic Park (SHP). Water normally reappears where the creek flows over bedrock outcropping several miles upstream of the California/Nevada state line.

2.3. Land Ownership and Uses

The majority of the land around Bodie Creek is managed by the BLM. The Bodie SHP, designated in 1962, is located near the headwaters of Bodie Creek and consists of the remains of the town of Bodie, a gold mining boomtown whose heyday was in the late 1800's. The town is preserved in a state of "arrested decay", with a museum/visitor center and picnic area, in addition to the remnants of the town, including homes,

churches, stores, hotels and mining equipment. The area surrounding Bodie SHP has been designated by the BLM as an Area of Critical Environmental Concern (ACEC). The 5,935 acre ACEC covers the zone of influence of the historic and associated visual resources, which deserve special recognition and management.

Multiple mining features can be found within the Bodie Creek Watershed. The Bodie Mine Complex includes approximately 3.5 miles of Bodie Creek, which flows through BLM-administered lands, private property (800 acres), and the Bodie SHP property (495 acres). Other mining features include a former ore milling operation (known as the Syndicate Mill), a large tailings impoundment, and numerous prospects, shafts, adits, and tailings piles (Dynamac, 2002) .

Private landholdings exist primarily downstream of the Bodie SHP. The majority of private land is used for livestock grazing and recreation. Recreational activities in area include hiking, biking, camping and off-road vehicle use.

2.4. Previous Investigations

BLM first identified contamination in Bodie Creek in 1985 when one surface water and one sediment sample indicated elevated levels of mercury and arsenic (Dynamac, 2002). These data were cited in the BLM's 1990 Draft Resource Management Plan and Environmental Impact Report for the Bodie area.

In 1992, the State Water Resources Control Board's Toxics Substance Monitoring Program (TSMP) data indicated silver concentrations in fish liver tissue were above the statewide 95th percentile "Elevated Data Level". The sampling location for the TSMP fish tissue data was approximately 2.5 miles downstream of the majority of mining occurrences centered around Bodie SHP.

In 1994, the Bodie Mine Complex Preliminary Assessment (PA) Report cited elevated levels of mercury, arsenic, and manganese in soil samples collected from Bodie Creek. Antimony, copper, lead, nickel and cyanide were also detected in levels above background concentration (CCJM, 1994).

The U.S. EPA reviewed the Bodie Mine Complex PA report, and identified several remaining concerns regarding waste source characterization and potential impacts to surface waters. Dynamac Corporation, contracted by the BLM, addressed these concerns with additional sediment and soil sampling in 2001, summarized in a final report dated February 2002. Various metals and cyanide were detected in sediment samples in Bodie Creek and the surrounding area, including arsenic, antimony, beryllium, cobalt, copper, chromium, lead, mercury, nickel, silver, and zinc (Dynamac, 2002).

2.5. Regulatory Involvement

The Lahontan Regional Water Quality Control Board (Regional Board), is the California state agency responsible for water quality protection east of the Sierra Nevada crest. The Regional Board, under its federally designated authority, administers the Clean Water Act (CWA) within the Lahontan Region.

Section 305(b) of the Clean Water Act (CWA) mandates biennial assessment of the nation's water resources, and these water quality assessments are used to identify and list those waters that are not achieving water quality standards. The resulting list is referred to as the 303(d) list. The CWA also requires States to establish a priority ranking for these impaired waters and to develop Total Maximum Daily Loads (TMDLs). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and it allocates pollutant loadings to point and non-point sources such that those standards will be met.

As detailed in previous investigations, sediment, fish tissue and surface water samples from Bodie Creek have indicated exceedances of various human health and aquatic life protection criteria. Based on these data, the Lahontan RWQCB placed Bodie Creek on the 303(d) list of impaired waters in 1991.

3. DATA QUALITY OBJECTIVES

3.1. Data Uses

The data generated from this investigation will be used to:

- Evaluate metals concentrations in surface water of Bodie Creek in comparison to relevant water quality criteria;
- Identify variations in water quality related to land uses;
- Assess magnitude of any spatial or temporal fluctuations in water quality to focus future monitoring or contaminant source assessment activities.

Analytical results will be compared to the applicable water quality criteria for metals (see Table 1 for specific action levels and sources). If exceedances of water quality objectives are noted, regulatory actions such as TMDL development or Non-point Source Pollution Control Program Implementation, etc., may be appropriate to address any water quality concerns.

A Project Report, summarizing the results of the investigation, along with conclusions and recommendations, will be made available to all interested parties. The Project Report will also be available electronically at:

http://www.swrcb.ca.gov/rwqcb6/TMDL/Bodie_Creek/Bodie_Index.htm

3.2. Contaminants of Concern

According to previous investigations, arsenic, antimony, beryllium, cobalt, copper, chromium, cyanide, lead, mercury, nickel, silver, and zinc have been detected in sediment, fish tissue and/or surface water in Bodie Creek.

3.3. Expected Concentrations

Low-level concentrations (part per billion). Sampling will follow procedures for trace metal water sample collection to the extent practicable (e.g., USGS, 1999).

3.4. Action Levels

Relevant numeric action levels include California Toxics Rule (CTR) aquatic life protection criteria, primary and secondary drinking water standards established by the U.S. EPA and/or California Department of Health Services. See Table 1 for numeric action levels and sources. No specific numeric water quality objectives for Bodie Creek are defined in the Lahontan RWQCB Basin Plan; however, the Basin Plan does specify narrative water quality standards to protect designated beneficial uses of Bodie Creek. Narrative water quality standards that are applicable include those for chemical constituents, non-degradation, pH and toxicity (Lahontan RWQCB, 1991).

The designated beneficial uses of Bodie Creek are: Municipal supply (MUN), agricultural supply (AGR), groundwater recharge (GWR), contact water recreation (REC-1), non-contact water recreation (REC-2), commercial and sportfishing (COMM), cold freshwater habitat (COLD), wildlife habitat (WILD), threatened, rare and endangered species (RARE), and spawning, reproduction and development (SPWN).

The RARE designation is appropriate since the federally-listed threatened Lahontan cutthroat trout occurs in limited numbers in the lower reaches of Bodie Creek near the Nevada state line.

3.5. Field Parameters, Analytes, Analytical Methods, Action Levels and Reporting Limits

3.5.1. Field Parameters

- pH
- Temperature
- Discharge (if flow is sufficient)
- Specific conductance
- Electrical conductance

3.5.2. Analytes, Analytical Methods, Action Levels and Reporting Limits

Table 1. Analytes, Analytical Methods, Action Levels and Reporting Limits

Analyte	Analytical Method	Action Level/Source ¹ (µg/L, dissolved fraction unless specified)	Reporting Limit (µg/L unless specified)
Hardness (dissolved Ca and Mg)	Calculated as per Standard Methods, 20 th edition	NA	NA
Ag	EPA 200.8	0.32-37 (hardness range 25 – 400)/ CTR Instantaneous Maximum	1.0
Al	EPA 200.8/200.7	87 (total fraction)/ EPA National Recommended Ambient Water Quality Criteria, Chronic 4-day average	50.0
As	EPA 200.8	10/ EPA Primary MCL	1.0
Ba	EPA 200.8/200.7	1,000/ DHS Primary MCL	100.0
Be	EPA 200.8/200.7	4/ DHS Primary MCL	1.0
Cd	EPA 200.8	0.8-6.2/ CTR Chronic 4-day average	0.25
Cr IV	EPA 7199	11/ CTR Chronic 4-day average	1.0
Cr (total)	EPA 200.8	50/DHS Primary MCL	2.0
Cu	EPA 200.8	2.7-29/ CTR Chronic 4-day average	0.5
Cyanide	EPA 335.2	5.2/ CTR Chronic 4-day average	5.0
Fe	EPA 200.8/200.7	300/ DHS & EPA Secondary MCL	100.0
Fl	EPA 300	2,000/ DHS Primary MCL	100.0
Hg	By amalgam ICP-MS or other suitable method	50 ng/L (total fraction)/ CTR sources of drinking water	10 ng/L
Mn	EPA 200.8/200.7	50/ DHS Secondary MCL	20.0
Ni	EPA 200.8	16-170 (hardness range 25-400)/ CTR Chronic 4-day average	5.0

Analyte	Analytical Method	Action Level/Source ¹ (µg/L, dissolved fraction unless specified)	Reporting Limit (µg/L unless specified)
Pb	EPA 200.8	0.54-11/ CTR Chronic 4-day average	0.5
Sb	EPA 200.8	6/ DHS Primary MCL	5.0
Se	EPA 200.8	5 (total fraction)/ CTR Chronic 4-day average	5.0
Th	EPA 200.8	1.7 (total fraction)/ CTR sources of drinking water	1.0
Zn	EPA 200.8/200.7	36-380 (hardness range 25-400)/ CTR Chronic 4-day average	10.0
Co	6010/7000 Series	50/ Agriculture Water Quality Goal	No greater than 50 µg/L
Mo	6010/7000 Series	10/ Agriculture Water Quality Goal	No greater than 10 µg/L

¹Marshack, 2003.

Acronyms: DHS – Department of Health Services; MCL – Maximum Contaminant Level; CTR – California Toxics Rule; µg/L – Micrograms per Liter; ng/L – Nanograms per Liter

3.6. Data Quality Indicators

3.6.1. Accuracy

Accuracy is the degree of agreement of a measurement with a known or true value. In the field, calibration with prepared standards provides information about the accuracy, or bias, of a field instrument. Calibration of field instruments will be completed according to Section 5.2.1.

In the lab, accuracy is usually assessed through the use of spiked samples (e.g., matrix spikes or surrogate spikes) or the analysis of a sample of known concentration (e.g., a performance evaluation sample or laboratory control sample [LCS].) State-certified laboratories, including CLS Labs, must provide information to verify their ability to produce data which is of known precision and accuracy, which in turn ensures that such data can be relied on to represent the true value for a given sample.

3.6.2. Precision

Precision is the degree of mutual agreement between or among independent measurements of a similar property (standard deviation [SD] or relative percent difference [RPD]). This indicator relates to the analysis of duplicate laboratory or field samples. An RPD of <20% (water) is generally acceptable, depending upon the chemical and matrix being analyzed.

3.6.3. Completeness

Completeness is expressed as the amount of usable data obtained compared to the amount that was expected to have been obtained. Expectation of completeness should be higher the fewer the number of samples taken per event or site. Due to a variety of circumstances, sometimes not all samples collected can be analyzed. If samples collected as part of this investigation cannot be analyzed, additional sampling events may be scheduled, based on best professional judgement and resource availability.

3.6.4. Representativeness

Sampling locations were planned to maximize the probability that representative samples will be collected by locating the sampling stations in a variety of stream locations. Representativeness is further addressed by sampling at least one month apart to capture varying flow regimes, and using "clean" sampling techniques to collect and analyze samples.

3.6.5. Comparability

Comparability expresses the confidence with which one data set can be compared to another. The use of standard, published EPA methods allows the data to be compared to data from other projects; using the same methods throughout allows for comparison of data within a project. Expressing data using units of measure consistent with the specified water quality objectives and reporting limits also addresses comparability.

3.7. Data Review and Management

After the hardcopy of analytical results are received, a minimum of two staff will verify that the results are reported with the correct units, that all test were completed within the required hold times, required detection limits were achieved, and that both the electronic and hardcopy results match and are reasonable for that site location (best professional judgement).

Data will be stored electronically in Microsoft Excel® format. Hardcopies will be stored in the Bodie Creek TMDL project file at the Lahontan RWQCB office.

4. SAMPLING DESIGN

4.1. Sampling Locations and Rationale

Sampling sites will be located near previously identified areas of concern, and positioned up or downstream of tributary confluences to assess changes in water quality relative to the tributary. Water samples collected near the headwaters of Bodie Creek where little mining activity has occurred will be used to assess potential background conditions. Sampling locations may vary due to flow limitations, safe access or weather conditions. Conceptual sampling sites are shown in Figure 2, and are described below:

Upstream of Bodie SHP, near headwaters area

- Represent potential background conditions, where mining activity has been minimal.

Bodie Creek, near State Park

- Elevated iron, manganese in surface water previously identified.
- Assess influence of mine tailings on water quality of Bodie Creek.

Bodie Creek, downstream of Syndicate Mill and Taylor Gulch

- Metals in sediments of former tailings pond.
- Cadmium in surface water of Taylor Gulch.

Approximately 2 miles upstream of state line

- Elevated silver in fish liver
- Iron in surface water

4.2. Sampling Frequency and Proposed Schedule

Three rounds of sampling to be conducted as follows:

- High flow snowmelt runoff period (April)
- Mid flow (May)
- Low flow (June).

5. SAMPLING METHODS AND PROCEDURES

5.1. Sampling Equipment

All equipment used for sampling will be clean and free of potential contaminants. A piece of new “C-Flex” tubing and a new disposable 0.45-micron filter will be used at each sample location to avoid cross contamination. Dedicated sampling kits will be prepared for each sample location prior to field mobilization. Each sampling kit will consist of a length of intake tubing connected to the filter with a hose clamp and two sets

of disposable gloves (powder-free and pigment-free) placed inside two color-free zip-lock bags. The kits will then be placed in a clean large plastic bag.

Only new bottles supplied by the contract laboratory will be used. Pre-preserved bottles supplied by the laboratory will be used for the collection of total mercury and cyanide samples.

5.1.1. Sampling Equipment Checklist

- Copy of SAP
- Pager and satellite phone with charger
- Site map with sampling stations marked and descriptions of stations.
- Disposable powder-free, color-free gloves
- Field notebooks
- New high density polyethylene or glass sample bottles supplied by contract lab
- Sample labels
- Distilled Deionized water (DDI) for cleaning pH probe (1 liter bottle, and 1 squirt bottle)
- DDI water for Field Method Blank (2 liters minimum)
- Portable wash water
- Permanent markers
- Pencils
- Peristaltic pump (charged)
- Extra fuses for peristaltic pump
- Cable to run peristaltic pump off car battery
- Sampling Kits (tubing with filter and gloves in double ziplock bag)
- Extra Tubing (new--stored in double ziplock bags)
- Extra 0.45 micron capsule filters (new--stored in double ziplock bags)
- Measuring tape
- Scissors
- Pliers
- Calculator
- YSI model 63 handheld pH, Conductivity, and temperature meter
- YSI model 63 operations manual
- Extra batteries for multi-meter
- Extra multi-meter (if available)
- pH Calibration solutions pH (4.0, 7.0 and 10.0)
- Model 1205 Price Type "mini" current meter and headset
- Top setting wading rod
- Ice chest
- First aid kit
- Appropriate safety equipment
- Blue ice (at least 3/ ice chest)
- Trash bag for disposal of used tubing, gloves, etc.

5.2. Field Sampling Procedures

5.2.1. Sample Procedures for Collecting Field Parameters (pH, Water Temperature, Conductivity, and Specific Conductance) and Field Instrument Calibration

- A YSI Model 63 handheld multi-meter will be used to measure pH, water temperature, electrical conductivity, and specific conductance. If the YSI is not available another multi-meter may be used and the name and model recorded in the field book.
- At the start of each sampling event field instruments will be calibrated using known standards for pH. A two-point calibration using the 4.0 & 7.0 standards will be acceptable, a three point calibration is preferred. During the day a calibration check may be done to ensure no drift in pH readings. A drift of <0.5 units pH will be considered an acceptable calibration check. If the calibration check is >0.5 units then the instrument should be re-calibrated prior to the next measurement.
- A check on Electrical Conductivity or Specific Conductance calibration will be done once a month back in the lab or on site. The manufacture (YSI) states that system calibration is rarely required because of the stability of the conductivity sensor.
- Field parameters will be taken downstream from the point where the water sampling is to be collected.
- Field parameters will be collected following the instrument manufacturer's instructions.
Note: On the YSI model 63 meter be sure that Specific Conductance (SC) is not confused with Electrical Conductivity. SC is conductivity that has been corrected for in-situ temperature. However, the internal YSI Specific Conductance software does not function at low water temperatures (<1°C) and will read "Lerr".
- After recording field measurements, thoroughly rinse the probe with DDI water.

5.2.2. Sample Procedures for Collecting Total Metals and "field-filtered" Dissolved Metals

Collection of water quality samples will be conducted prior to any other sampling activities that could disturb stream sediments and impact water quality (i.e. collection of flow, sediment, or aquatic invertebrate samples). Clean Hands/Dirty Hands sampling techniques (USGS, TRWI Book 9, 1999) shall be adhered to.

5.2.2.1. Collection of Dissolved Metals Samples

1. Water samples will be collected from moving water in riffle reaches of the stream.
2. Remove the tubing (with 0.45-micron filter attached) from the zip-lock bag and place through the pump head. The intake side will be placed

below the surface water level at approx. 0.6 of the total depth with care being taken to not disturb the sediment or metal-oxide precipitation. If needed, rocks may be placed on the tube to hold the position in the water column, but make sure intake has no chance of drawing in sediment. (Note: if sediment or metal-oxide is disturbed move the intake upstream).

3. Inspect filter visually for defects --you should not be able to see through filter.
4. Start filtering at a low speed to reduce the chance of air blockage. If filter looks or acts suspicious throw sample out and start over with a new filter and bottle.
5. Condition tubing and filter by drawing site water through tubing for 10-30 seconds.
6. Condition bottle and lid by rinsing three times with filtered sample water. If bottles are pre-preserved by the laboratory do not triple rinse.
7. Fill the bottle with filtered sample.
8. Transport samples on ice back to the RWQCB lab.
9. Once in the lab, assign one RWQCB unique sample-id to all samples collected from each station in lab log book.
10. Acidify the dissolved metals bottle to a $\text{pH} < 2$ with ultra pure HNO_3 . Record type of preservative on bottle. If bottles are pre-preserved by the laboratory do not add additional acid. **Caution: use gloves and safety glasses when working with concentrated acid.**

5.2.2.2. Collection of Total Metals, Total Mercury and Cyanide Samples

1. Continue using the same set of tubing that was used for the dissolved metals sample.
2. Remove the filter from the tubing and discard the used filter.
3. Flush sample through the tubing for 10-30 seconds.
4. Condition bottles and lids by rinsing three times with site water. If bottles are pre-preserved by the laboratory do not triple rinse.
5. Fill bottles fully.
6. Transport samples on ice back to the RWQCB lab.
7. Once in the lab, assign one RWQCB unique sample-id to all samples collected from each station in the lab log book.
8. Acidify the total metals bottle to a $\text{pH} < 2$ with ultra pure HNO_3 . Record on bottle type of preservative. If bottles are pre-preserved do not add additional acid (e.g., total mercury and cyanide samples). **Caution: use gloves and safety glasses when working with concentrated acid.**

5.3. Acidification of Metals Samples

Samples requiring preservation will be preserved in the Lahontan RWQCB laboratory with 48 hours of collection, or collected in bottles pre-preserved by the laboratory. To lessen risk of potential contamination of trace metals samples, field preservation will not be conducted. Metals samples will be preserved to a pH of less than 2 with ultra pure HNO_3 . After adding the acid the lid will be placed back on the sample container and the

container will be agitated to disperse the acid in the sample. Total mercury and cyanide samples will be collected in pre-preserved bottles supplied by the contract lab.

5.4. Alternative Procedures for Collecting Samples

This procedure will be used in the event of pump failure in the field (for example, due to battery failure or fuse blowouts). Samples for total metals, dissolved metals and any other analysis will be collected as grab samples, triple rinsing the bottles with station water prior to collection of sample. If available, 1000 ml bottles will be used for the collection of the dissolved metals sample. Samples will be transported to the RWQCB lab where the peristaltic pump can be used with AC electrical power. Dissolved metals samples will be filtered (0.45-micron filter) as described in Section 5.2.2.1, “Collection of Dissolved Metals Samples” Steps 2-10.

5.5. Field Information

5.5.1. Field Notes

The following information will be recorded in the bound field notebook:

- Sample date, time, types, numbers, and quantities;
- Sample container preservation steps performed;
- Sample locations or station identification (ID) number or code;
- Sampling equipment used;
- Decontamination steps performed;
- Calibration and maintenance actions;
- Information identifying other field equipment by equipment identification number, model/manufacturer, serial number, or other unique identifier; and
- Confirmation that Chain of Custody (COC) forms (See Section A4.2) were properly completed and sample custody transferred as required by this QAPP.

In addition, other ancillary information should be recorded, including:

- Summary of daily activities;
- Any deviations from the associated work plan, SAP, QAPP, or SOP;
- Time of arrivals/departures of Field Technician and/or other visitors to the sampling site(s);
- Weather conditions;
- Time and subject of any incoming or outgoing telephone/radio contacts; and
- Any unusual events.

5.5.2. Photographs

Photographs will be taken at each sampling site to document conditions and aid in future identification of site. Hardcopies of photographs will be stored in Lahontan RWQCB's Bodie Creek TMDL file. Photos may be scanned and stored in electronic format for use in reports and other documents.

5.5.3. GPS Documentation of Sampling Site Locations

A hand-held "mapping grade" Global Positioning System (GPS) unit (Trimble® GeoExplorer 3) will be used to record the latitude and longitude of each sampling site. All data will be post-processed using Trimble® Pathfinder Office software to ensure maximum accuracy (sub-meter). Data will be reported in the following format:

- Geographic Coordinates (latitude/longitude in decimal degrees)
- North American Datum (NAD) 1927.

6. QUALITY CONTROL PROCEDURES

6.1. Duplicates

During each water quality sampling trip one duplicate sample shall be taken at a single sampling location. Duplicate samples should be noted in the field notebook and assigned a false station-id (e.g., BC404-6) and a unique RWQCB sample-id.

6.2. Field Method Blanks

During each monthly water quality monitoring trip a field method blank (FMB) will be collected. The procedure for collecting the FMB shall consist of taking DDI water out to the field in an acid cleaned two-liter bottle and taking samples of this water following the same protocol used at all other sites. The FMB should be done at a site where contamination is most likely. The sample bottles are then handled identically to the other samples. Location of FMB samples should be noted in the field notebook and assigned a station-id (Field Method Blank) and RWQCB sample-id. Field method blanks are used to determine if contamination is occurring during collection, field filtration, and acidification process.

Split samples, spikes or trip blanks are currently not part of the SAP.

7. SAMPLE DOCUMENTATION AND SHIPPING

7.1. Bottles and Preservatives

Samples will be collected in new high density 500 mL polyethylene sample bottles supplied by contract lab (mercury and cyanide samples will be collected in pre-preserved bottles supplied by lab). Samples will be stored in ice chests and field-preserved with ice (wet or blue), chilled to at least 4 degrees Celsius. Total and dissolved metals (except total mercury) will be preserved within 48 hours of collection to a pH of less than 2 with ultra pure HNO₃, as specified in Section 5.3.

7.2. Sample Identification

Samples will be assigned a unique alpha-numeric designator using the following format: Waterbody initials, month and year of sample collection - site # (1-4, from upstream to downstream).

Example: BC404-1 (Bodie Creek, sampled April 2004, site 1 [most upstream site])

7.3. Preservation and Holding Times

Table 2. Preservation and Holding Times

Analyte	Preservation and Holding Times ¹
Total Metals (except total mercury)	Acidify w/in 48 hours; after acidification, samples can store up to 6 months at room temperature
Dissolved Metals	Acidify w/in 48 hours; after acidification, samples can store up to 6 months at room temperature
Cyanide	Collect in pre-preserved lab-supplied bottles; hold time is 14 days at 4° C, dark
Total Mercury	Collect in pre-preserved lab-supplied bottles; samples can store up to 6 months at room temperature

¹State Water Resources Control Board, SWAMP Quality Assurance Plan, 2002. Appendix C.

7.4. Chain of Custody, Packaging and Shipment

Samples will be driven by field staff to the Lahontan RWQCB laboratory, where they will be logging in using designated laboratory I.D. number, and stored overnight in refrigerator. Samples will be repacked into ice chests with completed COC forms supplied by lab, chilled with ice and shipped by next day Fed-Ex service to CLS Environmental Laboratory in Rancho Cordova, California, for analysis. One copy of the COC form will be retained in the Lahontan RWQCB lab for future reference.

8. REFERENCES

CCJM, 1994. *Bodie Mine Site Final Preliminary Assessment Report*.

Dynamac Corporation, 2002. *Final Sampling and Analysis Plan, Bodie Creek*. Prepared for U.S. Department of Interior, Bureau of Land Management.

Lahontan RWQCB, 1995. *Water Quality Control Plan for the Lahontan Region*.

Marshack, 2003. *A Compilation of Water Quality Goals*. Central Valley Regional Water Quality Control Board.

U.S. EPA, 1997. *Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) with Guidance*. Quality Assurance Program, United States Environmental Protection Agency - Region IX.

U.S. Bureau of Land Management, 1991. *Bishop Resource Management Plan and Environmental Impact Statement*, Volume 1.

U.S. Geological Survey, 1999. *Clean Hands/Dirty Hands Techniques for Water-Quality Sampling*. TWRI, Book 9, Chapter A4.

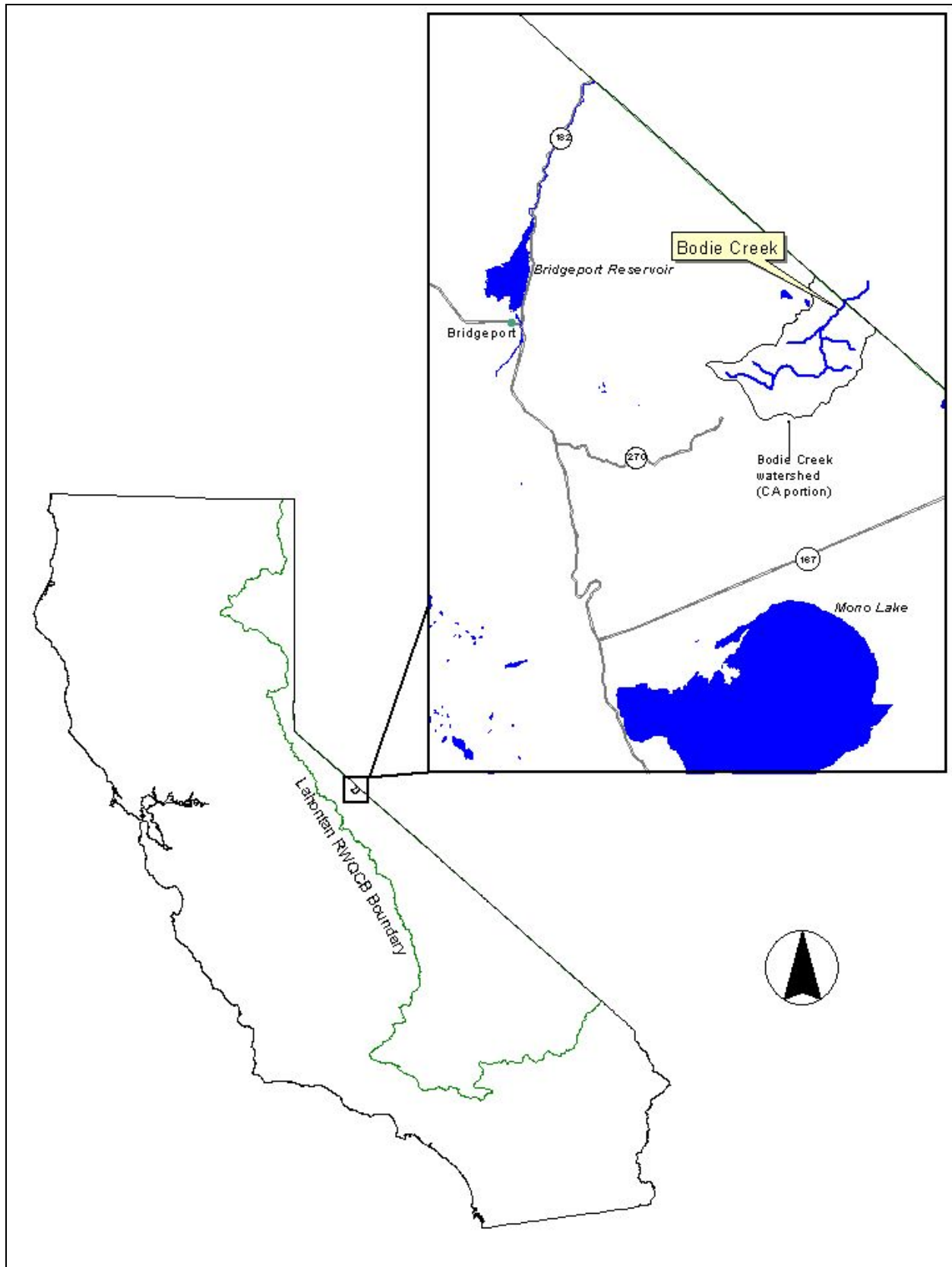


Figure 1. Bodie Creek Location.

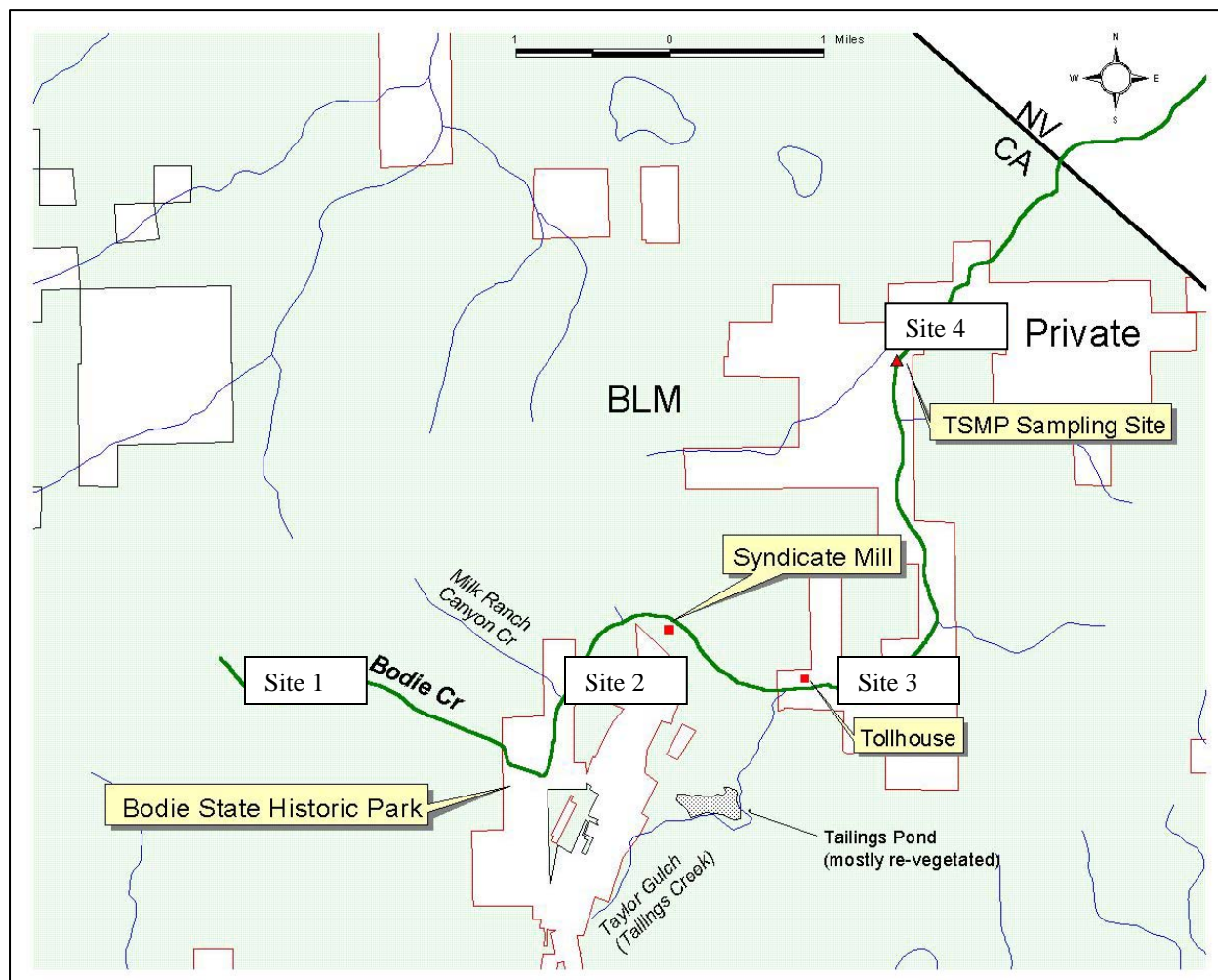


Figure 2. Bodie Creek Conceptual Sampling Sites and Areas of Interest.